

1     **CLAIMS**

2     What is claimed is:

3     1.   An extensible-markup-language Path Language (XPath)  
4     evaluating method for evaluating the XPath relevant to an  
5     extensible-markup-language (XML) document by use of a  
6     computer, the XPath evaluating method comprising:

7         a first step of serially inputting XML event strings  
8     constituting an XML document to be processed;

9         a second step of serially evaluating the XPath respec-  
10    tively relevant to the inputted XML events and retaining  
11    information concerning a result of partial evaluation of the  
12    XPath in given storing means when the XPath is partially  
13    established with respect to a given XML event; and

14        a third step of repeating the partial evaluation of the  
15    XPath along with the input of the XML event strings while  
16    considering the result of the partial evaluation retained in  
17    the storing means and evaluating that the XPath is estab-  
18    lished with respect to the XML document when the last part of  
19    the XPath is established.

20    2.   The XPath evaluating method according to claim 1,

21        wherein the second step includes the steps of:

1           generating an automaton for expressing the XPath to be  
2 evaluated; and

3           evaluating the XPath partially by allowing transition  
4 of a state of the automaton based on inputted respective XML  
5 events and retaining a result of the partial evaluation as  
6 the state of the automaton.

7    3.   The XPath evaluating method according to claim 1,

8           wherein the second step includes the steps of:

9           generating a first stack which expresses the XPath to  
10 be evaluated with a string of stack elements; and

11          generating a second stack for analyzing a nested struc-  
12 ture of the XML document to be processed based on respective  
13 inputted XML events and then evaluating the XPath partially  
14 by comparing the first stack with the second stack.

15    4.   The XPath evaluating method according to claim 1,

16          wherein the second step includes the steps of:

17          serially constructing a document tree indicating a  
18 document structure of the XML document to be processed based  
19 on input of respective XML events; and

20          evaluating the XPath along with construction of the  
21 document tree by use of the document tree including a part  
22 which has been constructed.

1 5. An XPath evaluating apparatus comprising:

2 an evaluation executing unit for inputting XML event  
3 strings constituting an XML document and serially evaluating  
4 the XPath with respect to each of XML events, while retaining  
5 information concerning a result of partial evaluation of the  
6 XPath when the XPath is partially established with respect to  
7 a given XML event, and evaluating that the XPath is estab-  
8 lished with respect to the XML document when the last step of  
9 the XPath is established; and

10 an XML event transferring unit for inputting the XML  
11 event strings constituting the XML document to be processed  
12 and serially transferring the XML event strings to the  
13 evaluation executing unit.

14 6. The XPath evaluating apparatus according to claim 5,  
15 further comprising:

16 an automaton generating unit for generating an automa-  
17 ton which expresses the XPath to be evaluated,

18 wherein the evaluation executing unit performs partial  
19 evaluation of the XPath by allowing a state of the automaton  
20 generated by the automaton generating unit to perform transi-  
21 tion based on the XML events transferred from the XML event  
22 transferring unit, and retains a result of the partial

1 evaluation as the state of the automaton.

2 7. The XPath evaluating apparatus according to claim 5,  
3 further comprising:

4 a stack generating unit for generating a first stack  
5 which expresses the XPath to be evaluated with a string of  
6 stack elements,

7 wherein the evaluation executing unit performs partial  
8 evaluation of the XPath by generating a second stack for  
9 analyzing a nested structure of the XML document subject to  
10 processing based on the XML events transferred from the XML  
11 event transferring unit and then comparing the first stack  
12 generated by the stack generating unit with the second stack.

13 8. An XPath evaluating apparatus comprising:

14 a document tree constructing unit for inputting XML  
15 event strings which constitute an XML document and serially  
16 constructing a document tree indicating a document structure  
17 of the XML document based on inputted XML events along with  
18 the input of the respective XML events;

19 an XML event transferring unit for inputting the XML  
20 event strings which constitute the XML document to be  
21 processed and serially transferring the XML event strings to  
22 the document tree constructing unit; and

1           an evaluation executing unit for evaluating the XPath  
2 along with construction of the document tree by the document  
3 tree constructing unit, using the document tree with a part  
4 which has been constructed.

5   9.   The XPath evaluating apparatus according to claim 8,  
6           wherein the evaluation executing unit retains informa-  
7 tion concerning a result of partial evaluation of the XPath  
8 when the XPath is partially established upon the evaluation  
9 of the XPath using the document tree.

10   10.   An information processing apparatus comprising:

11           an XML parser for analyzing an XML document to be  
12 processed and thereby generating XML event strings;

13           an XPath evaluating unit for serially inputting the XML  
14 event strings generated by the XML parser and evaluating the  
15 XPath with respect to each of inputted XML events by stream-  
16 ing processing; and

17           an application executing unit for inputting the XML  
18 events generated by the XML parser and performing processing  
19 with respect to the XML document configured by the XML events  
20 in response to an evaluation result of the XPath by the XPath  
21 evaluating unit,

22           wherein the XPath evaluating unit serially evaluates

1 the XPath with respect to each of the XML events, retains  
2 information concerning a result of partial evaluation of the  
3 XPath when the XPath is partially established with respect to  
4 a given XML event, and judges that the XPath is established  
5 with respect to the XML document when the last step of the  
6 XPath is established.

7 11. The information processing apparatus according to claim  
8 10,

9 wherein the XPath evaluating unit generates an automa-  
10 ton for expressing the XPath to be evaluated,

11 performs partial evaluation of the XPath by allowing  
12 transition of a state of the automaton based on the XML  
13 events generated by the XML parser, and retains a result of  
14 the partial evaluation as the state of the automaton.

15 12. The information processing apparatus according to claim  
16 10,

17 wherein the XPath evaluating unit generates a first  
18 stack which expresses the XPath to be evaluated with a string  
19 of stack elements, generates a second stack for analyzing a  
20 nested structure of the XML document to be processed based on  
21 the XML events generated by the XML parser, and performs  
22 partial evaluation of the XPath by then comparing the first

1     stack with the second stack.

2     13.   The information processing apparatus according to claim  
3     10,

4             wherein the XPath evaluating unit serially constructs a  
5     document tree indicating a document structure of the XML  
6     document to be processed based on inputted XML events along  
7     with the input of the respective XML events generated by the  
8     XML parser, and evaluates the XPath by use of the document  
9     tree with a part which has been constructed.

10    14.   A program for controlling a computer to evaluate the  
11    XPath with respect to an XML document, the program causing  
12    the computer to execute the procedures for carrying out the  
13    steps of claim 1.

14    15.   An article of manufacture comprising a computer usable  
15    medium having computer readable program code means embodied  
16    therein for causing evaluation of the XPath relevant to an  
17    extensible-markup-language (XML) document, the computer  
18    readable program code means in said article of manufacture  
19    comprising computer readable program code means for causing a  
20    computer to effect the steps of claim 1.

1 16. A program storage device readable by machine, tangibly  
2 embodying a program of instructions executable by the machine  
3 to perform method steps for evaluating the XPath relevant to  
4 an extensible-markup-language (XML) document, said method  
5 steps comprising the steps of claim 1.

6 17. A computer-readable recording medium comprising the  
7 program according to claim 14.

8 18. A computer program product comprising a computer usable  
9 medium having computer readable program code means embodied  
10 therein for causing XPath evaluation, the computer readable  
11 program code means in said computer program product compris-  
12 ing computer readable program code means for causing a  
13 computer to effect the functions of claim 5.

14 19. A computer program product comprising a computer usable  
15 medium having computer readable program code means embodied  
16 therein for causing XPath evaluation, the computer readable  
17 program code means in said computer program product compris-  
18 ing computer readable program code means for causing a  
19 computer to effect the functions of claim 8.

20 20. A computer program product comprising a computer usable



1 medium having computer readable program code means embodied  
2 therein for causing information processing, the computer  
3 readable program code means in said computer program product  
4 comprising computer readable program code means for causing a  
5 computer to effect the functions of claim 10.